Title

Perceived goal instrumentality is associated with forgiveness: A test of the valuable relationships hypothesis

Journal

Evolution and Human Behavior, 41(1)

ISSN

1090-5138

Authors

Smith, Adam
McCauley, Thomas G
Yagi, Ayano
et al.

Publication Date

2020

DOI

10.1016/j.evolhumbehav.2019.09.003

Peer reviewed

Evolution and Human Behavior 41 (2020) 58–68

Contents lists available at ScienceDirect

Evolution and Human Behavior

journal homepage: www.elsevier.com/locate/ens

Perceived goal instrumentality is associated with forgiveness: A test of the valuable relationships hypothesis

Adam Smith[a], Thomas G. McCauley[b,c], Ayano Yagi[d], Kazuho Yamaura[e], Hiroshi Shimizu[f], Michael E. McCullough[b,c], Yohsuke Ohtsubo[g,*]

[a] Nagoya University, Japan
[b] University of Miami, United States of America
[c] University of California San Diego, United States of America
[d] Kochi University of Technology, Japan
[e] Ritsumeikan University, Japan
[f] Kwansei Gakuin University, Japan
[g] Kobe University, Japan

ARTICLE INFO

Keywords:
Forgiveness
Valuable relationships hypothesis
Relationship value
Goal instrumentality
Exploitation risk
Empathy

ABSTRACT

Three autobiographical studies tested the valuable relationships hypothesis of forgiveness. Although previous studies revealed that relationship value predicts interpersonal forgiveness, the measure of relationship value may be conflated with affective assessments of the relationship with the transgressor, which might have caused a criterion contamination problem. Therefore, we assessed the goal-related instrumentality of the transgressor (i.e., how useful the transgressor is for helping the victim to achieve his/her goals in fitness-relevant domains). Three studies, one involving a Japanese student sample (Study 1), a second involving Japanese community sample (Study 2), and a third involving U.S. community sample (Study 3), convergently showed that perceived goal instrumentality, as well as a latent relationship value variable estimated from multiple measures of relationship value, are associated with forgiveness. Moreover, this association could be explained in part by the intermediate association of perceived goal instrumentality with empathy both in Japan and the U.S.

1. Introduction

Interpersonal conflicts occur within close relationships over even trivial issues. For example, roommates may quarrel over the volume of music, or romantic partners may disagree on where to spend the evening. However, these relationships are often too valuable to lose over such relatively minor conflicts. The same holds true for other primates whose fitness relies heavily on cooperative partnerships with other individuals. Accordingly, de Waal and Aureli (1997) proposed the valuable relationships hypothesis, which posits that primates are equipped with evolved psychological mechanisms to settle conflicts over relatively minor resources to repair endangered valuable relationships. In other words, the hypothesis presumes that the ultimate cause of primate appeasement/reassurance gestures and conciliatory tendencies is these behaviors' function to maintain valuable relationships. In fact, it has been shown that primates more readily reconcile with their valuable partners than non-valuable partners after conflicts (see de Waal & Aureli, 1997, Aureli and de Waal, 2000; de Waal, 2000, for reviews). Recently, this adaptationist approach to reconciliation has been applied to help explain some dynamics of human reconciliation (McCullough, 2008; McCullough et al., 2013).

The central prediction of the valuable relationships hypothesis is that people are more willing to reconcile with valuable partners than with less valuable ones (see Petersen, Sell, Tooby, & Cosmides, 2012, for the similar prediction in the context of criminal justice). In a prospective longitudinal study, McCullough, Luna, Berry, Tabak, and Bono (2010) found that victims tend to forgive their transgressors when they perceive the relationship as valuable (see also McCullough, Pedersen, Tabak, & Carter, 2014). Burnette, McCullough, Van Tongeren, and Davis (2012) not only conceptually replicated this relationship value–forgiveness association, but also found that this association is moderated by the perception of (future) exploitation risk. That is, victims tend not to forgive even valuable partners if they perceive that the partner is likely to exploit them again. Testing the hypothesis from the transgressors' perspective, Ohtsubo and Yagi (2015) found that participants were more eager to reconcile with their valuable partners. The

* Corresponding author at: Graduate School of Humanities, Department of Psychology, Kobe University, Kobe 657-8501, Japan.
E-mail address: yohtsubo@lit.kobe-u.ac.jp (Y. Ohtsubo).

https://doi.org/10.1016/j.evolhumbehav.2019.09.003
Received 20 March 2019; Received in revised form 30 July 2019; Accepted 13 September 2019

eagerness was operationalized as their willingness to incur some cost in apologizing to their victim, which is known to make an apology appear more sincere in the eyes of a victim (Ohtsubo et al., 2012; Ohtsubo et al., 2018; Ohtsubo & Watanabe, 2009).

1.1. Operationalization of relationship value

The aforementioned findings indicate that people are more motivated to reconcile with valuable partners. However, relationship value measured in previous studies often included relatively subjective evaluations of a target relationship that might share some affective components with the outcome variable (i.e., forgiveness). For example, the following items were used to measure relationship value in Burnette et al.'s (2012) studies: "He/she is worthless to me" (reverse coded); "I feel like our interests and personalities are very compatible." Forgiveness was also measured by items that address affective reactions to the transgressor (e.g., "I am trying to keep as much distance between us as possible"; "I am finding it difficult to act warmly toward him/her"). Thus, the observed association between relationship value and forgiveness might be due in part to criterion contamination (e.g., a general aversion to saying affectively negative things about other people). Therefore, replications of the relationship value–forgiveness association using a less affectively laden measure of relationship value are desirable.

To counteract this criterion contamination problem, Ohtsubo and Yagi (2015) employed a different operationalization of relationship value that was designed to minimize affective evaluation of a target relationship. In particular, they operationalized relationship value as participants' perceptions of the utility or instrumentality of a relationship (see Fitzsimons & Shah, 2008, for a definition of the goal instrumentality of relationship partners). In short, their measure generates a metric of how instrumental a specific person is perceived to be by averaging how much of a help or hindrance that individual is perceived to be for achieving one's goals across fitness-relevant domains of life, such as jobs (status), romantic relationships (reproduction), and interpersonal relationships (coalitions). The present research attempts to replicate Burnette et al.'s (2012) and McCullough et al.'s (2010, 2014) results using this perceived goal instrumentality measure of relationship value. We predicted that a measure of relationship value that is based on the perceived instrumentality of the transgressor to the fulfillment of important life goals will be associated with forgiveness of the transgressor.

1.2. Role of empathy

Although the work presented here attempts to dissociate affective aspects from the measurement of relationship value, we do not mean to suggest that the proximate cause of human reconciliation is entirely a "cold" deliberative process. In other words, we do not posit that the relationship value–forgiveness association can be fully accounted for by one's deliberate attempt to continue a valuable relationship based on explicit cost–benefit calculations (cf. Worthington, Witvliet, Pietrini, & Miller, 2007). In contrast, we consider that emotions play a pivotal role in commitment to mutually beneficial relationships. Testing the effect of goal instrumentality from the transgressor's perspective, Nelissen (2014) showed that people tend to feel stronger guilt when they offended a partner who is more instrumental for them to attain a certain goal than a partner who is less instrumental. Likewise, Ohtsubo and Yagi (2015) showed that an increased sense of guilt mediates the goal instrumentality–costly apology association.

Empathy for the transgressor is known to be an important proximate cause of forgiveness (e.g., McCullough et al., 1998; McCullough, Worthington, & Rachal, 1997; see also Fehr, Gelfand, & Nag, 2010, for a meta-analytic review). Extrapolating from the goal instrumentality–guilt association to the forgiveness context, we predict that a victim who finds the transgressor more instrumental is more likely to feel empathy for the transgressor. There is suggestive empirical evidence for this prediction. In a series of experiments examining the effect of goal instrumentality on relationship evaluations, Fitzsimons and Shah (2008) manipulated accessibility of a particular goal (e.g., academic achievement) in their participants and assessed the participants' evaluations of two real friends: one was instrumental for them to achieve the primed goal and the other was neutral. Fitzsimons and Shah showed that the experimentally heightened accessibility of a particular goal increased perceived closeness to the instrumental, but not neutral, friend. Because other studies have shown also that closeness facilitates empathy (e.g., Beeney, Franklin, Levy, & Adams, 2011; Meyer et al., 2013), it is plausible that goal instrumentality promotes empathy as well. Therefore, we predict that empathy engendered by perceived goal instrumentality promotes forgiveness. Notice, however, that this prediction does not logically follow from the valuable relationships hypothesis because the ultimate cause does not specify which proximate cause (e.g., cognition, empathy, or other emotions) in fact evolved to serve the function. Thus, the test of this prediction is considered as a novel empirical extension of the previous research on the valuable relationships hypothesis (Burnette et al., 2012; McCullough et al., 2010, 2014).

1.3. Secondary purposes

There were two secondary purposes of this study. First, this study aimed at testing the cross-cultural replicability of Burnette et al.'s (2012) finding of an interaction between relationship value and perceived exploitation risk that suggests that people are prone to forgiving a valuable transgressor insofar as they anticipate that he/she is unlikely to exploit them again. Although Burnette et al. replicated this interaction effect in two studies, both studies were conducted in the United States. To our knowledge, no cross-cultural replications have been reported. Furthermore, no studies have yet tested whether the association between perceived goal instrumentality and forgiveness, if present, is similarly moderated by perceived exploitation risk.

Second, because we included multiple measures of relationship value in all three studies, for an exploratory purpose, we estimated the latent factor underlying the variously operationalized relationship value measures and then used that latent variable to test the relationship value–forgiveness association. Recall that we purposefully eliminated affectively-laden components of relationship value from our measure of goal instrumentality. Therefore, it is worthy to investigate whether both non-affective and affective measures of relationship value reflect an underlying latent construct, and whether this latent factor predicts forgiveness.

In sum, across a series of three autobiographical studies we tested two predictions which regard an ultimate cause and a proximate cause of human forgiveness, respectively. (i) Perceived goal instrumentality is associated with forgiveness. And, (ii) the association between perceived goal instrumentality and forgiveness is mediated by empathy. In addition, this study addressed two secondary research questions. (iii) Is the relationship value × exploitation risk interaction replicable in Japan and with the perceived goal instrumentality measure? And, (iv) does a latent relationship value construct underlie various measures of relationship value, and predict variance in forgiveness?

2. Study 1: survey with a student sample from Japan

2.1. Method

2.1.1. Participants

In Ohtsubo and Yagi's (2015) study, the perceived goal instrumentality–apology correlation was approximately 0.20, and we expected the perceived goal instrumentality–forgiveness correlation to be of a similar magnitude. However, to hedge against Type II error (if the true effect size turned out to be substantially smaller than $r = 0.20$),

we calculated the desired sample size to ensure a power of 0.80 for a correlation of 0.18. This power analysis yielded a sample size of 240. Therefore, we decided to collect at least 250 participants in each of the three studies.

A total of 332 Japanese students from two large Japanese universities participated in Study 1. The sample included 13 high school students who were auditing a university lecture. In total, 52 participants were excluded from data analyses because they did not follow the transgression-eliciting instructions (see Section 2.1.2). The specific reasons were as follows: no transgression reported (36), the transgressor was a relative (5), the participant reported an incident involving multiple transgressors (5), the transgressor was a stranger (4), and the transgression did not occur within the past year (2). The remaining sample consisted of 280 Japanese students (118 women; 3 unspecified sex) who ranged in age from 17 to 23 years old ($M = 19.78$, $SD = 0.99$).

2.1.2. Procedure and materials

Participants completed the questionnaire either in small group sessions or in mass testing sessions. All materials for this study were administered in Japanese.

Participants first recalled and briefly transcribed a recent incident in which they were harmed (either physically, financially, or emotionally), betrayed, or otherwise wronged by a non-relative. They were instructed not to recall an incident involving a total stranger. To assure that participants described an incident with an appropriate transgressor, they indicated their relationship type (e.g., friend, classmate, romantic partner) at the time of the transgression. Participants also rated their level of anger at the time of transgression with three items: "How angry were you at the transgressor?"; "How much did you want to avoid seeing the transgressor?"; "How much did you want to retaliate against the transgressor?" (1 = not at all to 5 = very much). Then, participants rated their pre-transgression feeling of closeness to the transgressor using the Inclusion of Other in the Self (IOS) Scale (Aron, Aron, & Smollan, 1992). The anger and closeness scores were included as control variables.

Our primary measure of relationship value (i.e., perceived goal instrumentality) originates from Ohtsubo and Yagi's (2015) research. Participants were asked to rate the instrumentality of their transgressor, just prior to the transgression, using a 7-point scale (−3 to +3; four labels were provided for −3 [an extreme hindrance], −1 [somewhat of hindrance], +1 [somewhat of a help], and + 3 [an extreme help]). Specifically, they rated how much of a help or hindrance their transgressor was, before the time of incident, for achieving goals in the following six domains of life: studies at university, club and sports activities, finding a job or continuing education, interpersonal relationships, part-time work, and other important goals. Participants were allowed to choose "non-applicable" for any items that did not relate to them, in which case the item was removed from the calculation of the participant's mean score on this measure.

It is known that transgressors' conciliatory gestures facilitate forgiveness (Tabak, McCullough, Luna, Bono, & Berry, 2012) and victims' rumination about a particular transgression hinders forgiveness (McCullough, Bono, & Root, 2007), so we assessed post-event transgressor conciliation and rumination as control variables. Participants reported whether their transgressor exhibited six conciliatory gestures (apologized, treated [or offered to treat] you to lunch or a snack, explained why it happened, bought you a gift, expressed shame/embarrassment, and repaired [or try to repair] the harm/damage). We counted the number of "yes" responses to these six items, and used this as the transgressor (conciliatory) reaction score. We measured rumination about the transgression with the seven-item intrusion subscale of Horowitz, Wilner, and Alvarez's (1979) Impact of Event scale. Sample items included "I had waves of strong feelings about it," and "Any reminder brought back feelings about it." The rumination items were rated on a 4-point scale (0 = never to 3 = often). This scale was translated into Japanese by the authors using the back-translation method.

We measured empathy using five items, rated on a 5-point scale (1 = strongly disagree to 5 = strongly agree), adapted from Batson, Duncan, Ackerman, Buckley, and Birch (1981). Example items are: "I feel empathy towards him/her," and "I have warm feelings toward him/her." These empathy items were mixed with the 10 items of Burnette et al.'s (2012) Relationship Value and Exploitation Risk (RVEX) scale. Sample items of exploitation risk include "I feel threatened by him/her" and "I feel like he/she might do something bad to me again" (see the Introduction for sample items of relationship value). The RVEX was translated into Japanese by the authors using the back-translation method.

To measure forgiveness, we used the 18-item Transgression Related Interpersonal Motivations Inventory (TRIM; McCullough et al., 2010) using a 5-point scale (1 = strongly disagree to 5 = strongly agree). Sample items include "I'll make him/her pay," "I am avoiding him/her," and "Even though his/her actions hurt me, I have goodwill for him/her." The Japanese version was adapted from Ohtsubo, Yamaura, and Yagi's (2015) study. The TRIM includes measures of revenge and avoidance motivations, both of which decline as one forgives a transgressor, as well as benevolence motivations. Although the TRIM yields a single metric of unforgiveness, we reverse-coded the score in our analyses, such that higher TRIM scores indicate greater forgiveness.

Although we additionally assessed participants' current feeling of closeness and perceived goal instrumentality, we did not include these data in the subsequent analyses because they were irrelevant to the present purpose. As these scores are available at the Open Science Framework (https://osf.io/tr569/), interested readers can analyze by themselves.

2.1.3. Latent relationship value factor

To extract the latent factor scores, using the lavaan package in R (Rosseel, 2012), we fit a latent relationship value model using two indicators (i.e., the goal instrumentality and RVEX relationship value measures). In order to globally identify the latent relationship value model, the factor loadings of the indicators were constrained to be equal and the factor variance was set to unity. Although the model fit poorly ($\chi^2(1) = 51.75$, $p < .001$, CFI = 0.264, RMSEA = 0.426), the purpose of this model was only to extract factor scores for use in preliminary analyses. In addition, Forster et al. (unpublished manuscript) recently took the latent factor approach to conceptualize forgiveness. It is thus interesting to include latent forgiveness in our analyses and examine the relationship value–forgiveness association at the latent factor level, and examine whether latent relationship value predicts latent forgiveness. We conducted a series of such exploratory analyses for the three studies. We report the results in the Supplementary Materials.

2.2. Results

2.2.1. Descriptive statistics and the relationship value × forgiveness correlation

Descriptive statistics of variables of interest (means, standard deviations, Cronbach's α coefficients, and correlations among the variables) are summarized in Table 1. As can be seen in Table 1, perceived goal instrumentality and RVEX relationship value were moderately correlated, $r_{277} = 0.47$, $p < .001$, 95% CI [0.37, 0.56] (the p-value was adjusted for multiple comparisons by the Holm method), consistent with the idea that they might share common construct variance but different sources of method variance. In addition, perceived goal instrumentality was significantly correlated with forgiveness, $r_{277} = 0.44$, $p < .001$, 95% CI [0.34, 0.53] (p-value adjusted by the Holm method). Confirming our assumption that perceived goal instrumentality is less affectively laden than RVEX relationship value, the zero-order correlation of perceived goal instrumentality and empathy (0.37) is

Table 1
Descriptive statistics (the number of observations, means, standard deviations), Cronbach's α coefficients (in parentheses in the diagonal cells), and correlation coefficients of variables of interest (study 1).

	N	mean	*SD*	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Forgiveness	279	3.46	0.71	(0.89)	0.44***	0.61***	−0.36***	0.24***	−0.56***	0.17*	0.76***	−0.34***
2. Instrumentality	280	0.32	0.85		(0.78)	0.37***	−0.15	0.24***	−0.21**	0.24**	0.47***	−0.20*
3. Empathy	279	2.5	0.89			(0.83)	−0.01	0.36***	−0.43***	0.35***	0.75***	0.09
4. Rumination	280	1.07	0.78				(0.91)	.17[a]	0.40***	0.04	−0.18*	0.33***
5. IOS	280	3.66	1.77					- -	0.00	0.30***	0.40***	−0.08
6. Anger	280	3.27	0.99						(0.71)	−0.07	−0.47***	0.24**
7. Reaction	275	1.47	1.52							- -	0.31***	−0.03
8. RV (RVEX)	279	3.01	0.99								(0.87)	−.15[a]
9. ER (RVEX)	279	2.29	0.78									(0.70)

"Instrumentality" "RV," and "ER" designate perceived goal instrumentality, relationship value, and exploitation risk, respectively. (The *p*-values reported in this table were adjusted by the Holm method).
[a] < 0.10.
* < 0.05.
** < 0.01.
*** < 0.001.

significantly smaller than the zero-order correlation between RVEX relationship value and empathy (0.75), $t(276) = 9.29$, $p < .001$ by Hotelling's test for correlated correlations.

2.2.2. Is the relationship value–forgiveness association explained by confounding variables?

We examined whether perceived goal instrumentality, RVEX relationship value, and latent relationship value predict forgiveness even after controlling for potential confounding variables: closeness (labeled as "IOS" in Tables 1 and 2), anger at the transgressor, transgressor reaction, and sex (coded as male = 1 and female = 2). We did not include rumination as a control variable because it was not significantly correlated with perceived goal instrumentality. A series of multiple regression analyses indicated that perceived goal instrumentality, RVEX relationship value, and latent relationship value were significantly associated with forgiveness (β = 0.30, $p < .001$, 95% CI [0.20, 0.39] for perceived goal instrumentality; β = 0.65, $p < .001$, 95% CI [0.56, 0.75] for RVEX relationship value; and β = 0.43, $p < .001$, 95% CI [0.34, 0.53] for latent relationship value) even after controlling for the potential confounds (Table 2; see also Table S1 for 95% CIs of the regression coefficients).

Table 2
Multiple regression analyses predicting forgiveness from sex, closeness, anger, and transgressor reaction, one of the four measures of relationship value, and latent relationship value.

	Study 1		Study 2		Study 3	
	β	SE	β	SE	β	SE
Perceived goal instrumentality	0.30***	0.048	0.16***	0.036	0.13**	0.038
Sex (male = 1, female = 2)	0.07	0.046	−0.01	0.034	0.05	0.037
Closeness (IOS)	0.16*	0.049	0.19***	0.036	−0.01	0.040
Anger at the transgression	−0.49***	0.047	−0.49***	0.036	−0.51***	0.037
Transgressor reaction	0.03	0.049	0.11**	0.036	0.28***	0.039
RVEX relationship value	0.65***	0.048	0.50***	0.034	0.69***	0.032
Sex (male = 1, female = 2)	0.04	0.038	0.02	029	−0.00	0.026
Closeness (IOS)	−0.01	0.043	0.11***	0.031	−0.06*	0.027
Anger at the transgression	−0.25***	0.044	−0.37***	0.031	−0.25***	0.029
Transgressor reaction	−0.04	0.041	0.00	0.031	0.06*	0.029
Rank relationship value	- -	- -	0.19***	0.035	0.00	0.039
Sex (male = 1, female = 2)	- -	- -	−0.02	0.034	0.05	0.037
Closeness (IOS)	- -	- -	0.18***	0.036	0.02	0.039
Anger at the transgression	- -	- -	−0.49***	0.035	−0.53***	0.038
Transgressor reaction	- -	- -	0.11**	0.036	0.29***	0.039
Welfare Tradeoff Ratio (WTR)	- -	- -	0.07	0.041	0.08	0.049
Sex (male = 1, female = 2)	- -	- -	−0.01	0.041	0.05	0.042
Closeness (IOS)	- -	- -	0.19***	0.047	−0.01	0.048
Anger at the transgression	- -	- -	−0.58***	0.044	−0.56***	0.044
Transgressor reaction	- -	- -	0.18***	0.046	0.31***	0.046
Latent relationship value	0.43***	0.048	0.49***	0.042	0.26***	0.048
Sex (male = 1, female = 2)	0.07	0.043	0.00	0.034	0.06	0.039
Closeness (IOS)	0.10	0.047	0.07+	0.037	−0.09	0.045
Anger at the transgression	−0.41***	0.045	−0.38***	0.037	−0.46***	0.042
Transgressor reaction	0.00	0.046	0.03	0.037	0.26***	0.042

The 95% CIs are reported in the Supplementary Materials (Tables S1, S2, and S3 for Studies 1, 2, and 3, respectively).
+ < 0.10.
* < 0.05.
** < 0.01.
*** < 0.001.

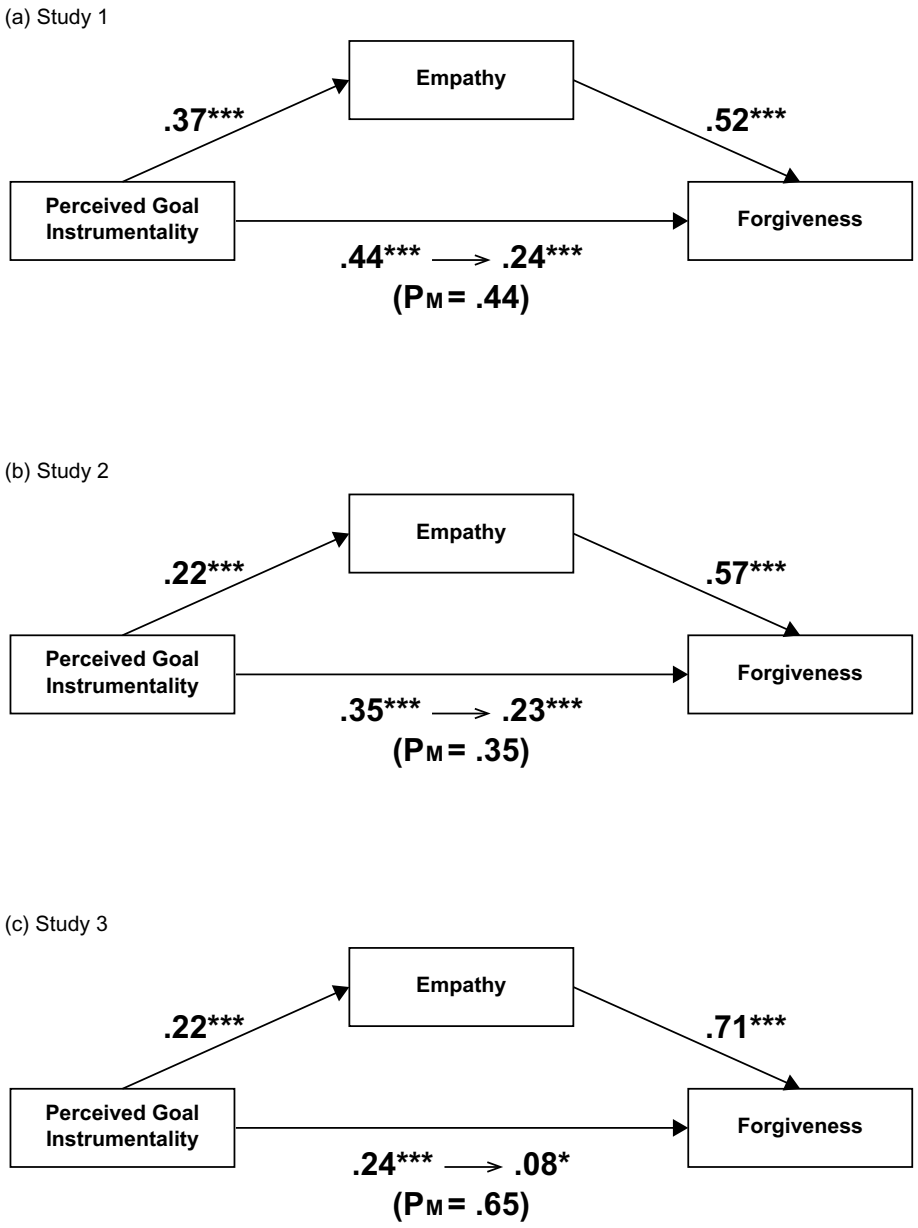

Fig. 1. Empathy partially mediates the association between perceived goal instrumentality and forgiveness in (a) Study 1, (b) Study 2, and (c) Study 3. Values listed in the path diagram represent standardized regression coefficients (β).
* < 0.05, *** < 0.001.

2.2.3. Is the relationship value–forgiveness association mediated by empathy?

To test whether the association of relationship value with forgiveness is mediated by empathy, we first examined the zero-order correlations among our three main variables. As shown in Table 1, perceived goal instrumentality was significantly correlated with forgiveness (r_{277} = 0.44, p < .001, 95% CI [0.34, 0.53]) and empathy (r_{277} = 0.37, p < .001, 95% CI [0.27, 0.47]), and empathy was significantly correlated with forgiveness (r_{277} = 0.61, p < .001, 95% CI [0.53, 0.68]). As shown in Fig. 1a, once the association of empathy with forgiveness was statistically controlled for, the association between perceived goal instrumentality and forgiveness decreased from 0.44 to 0.24 (p < .001). This result is consistent with partial mediation, which we confirmed using the bootstrapping procedure with 10,000 samples. The estimated indirect effect was 0.20, 95% CI [0.13, 0.26]. We next calculated the percent of the total effect accounted for by the indirect effect (i.e., percent mediation or P_M). In this case, P_M was 0.44, indicating that 44% of the effect of perceived goal instrumentality on forgiveness was accounted for by empathy.

We explored the robustness of the mediation by empathy using the RVEX relationship value and latent relationship value as predictor variables. Although we observed a similar pattern for the RVEX relationship value (indirect effect = 0.08, see Fig. S1a in the Supplementary Materials), the 95% CI of the indirect effect [−0.008, 0.17] included 0. Partial mediation was observed for the latent measure of relationship value, however (Fig. S4a in the Supplementary Materials): The association between relationship value measured as a latent trait and forgiveness decreased from 0.59 to 0.37 (p < .001; P_M = 0.37). The indirect effect was 0.22, 95% CI [0.15, 0.29]. Thus, the partial mediation by empathy between relationship value and forgiveness seems robust across different operationalizations (although it failed to reach the conventional significance level when RVEX relationship value was used).

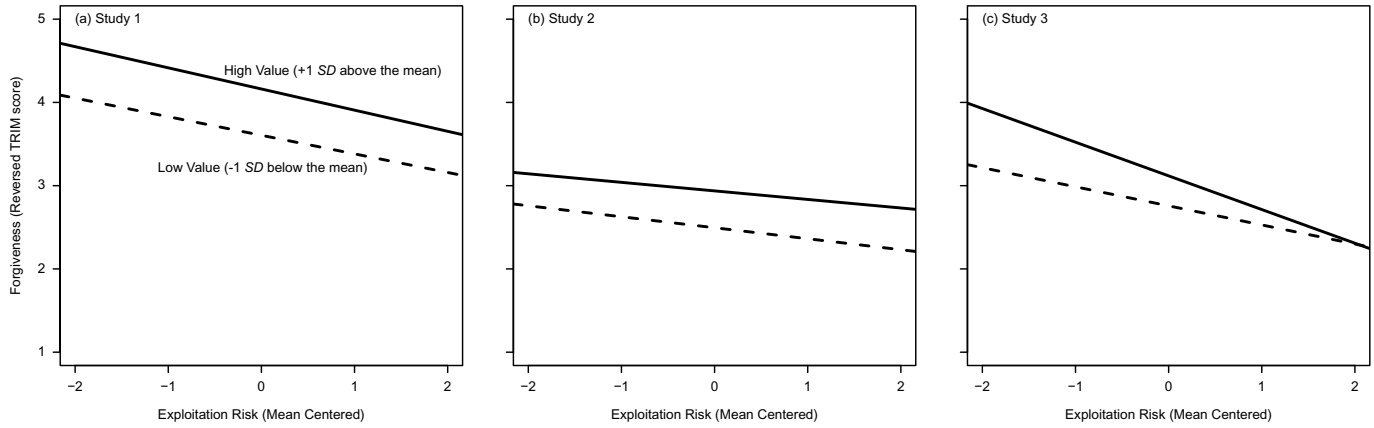

Fig. 2. Regression lines predicting forgiveness from exploitation risk at the two levels of perceived goal instrumentality (1 *SD* above and below the mean).

2.2.4. Does exploitation risk moderate the relationship value–forgiveness association?

To test the cross-cultural replicability of Burnette et al.'s (2012) finding that perceived exploitation risk moderates the effect of relationship value on forgiveness, we conducted a multiple regression analysis whereby forgiveness was predicted from perceived goal instrumentality and exploitation risk as well as their interaction term. Although the effects of perceived goal instrumentality and exploitation risk were both significant ($\beta = 0.39$, $p < .001$, 95% CI [0.28, 0.50] for perceived goal instrumentality; $\beta = -0.26$, $p < .001$, 95% CI [−0.37, −0.16] for exploitation risk), contrary to Burnette et al.'s results, the interaction effect was not significant, $\beta = -0.02$, $p = .746$, 95% CI [−0.12, 0.09]. Fig. 2a displays the effect of exploitation risk at two levels of perceived goal instrumentality (1*SD* ± mean) to visually verify the non-significant interaction (Cohen & Cohen, 1983). We also confirmed the non-significant interaction effect for different operationalizations of relationship value (see Table S4 in the Supplementary Materials).

2.3. Study 1 discussion

Study 1 confirmed two of our primary predictions. Relationship value operationalized as perceived goal instrumentality was positively associated with forgiveness, and this perceived goal instrumentality–forgiveness association was partially mediated by empathy. The same pattern emerged regardless of how relationship value was operationalized (but partial mediation by empathy for RVEX relationship value failed to reach the conventional level of statistical significance). Although one might suspect that goal instrumentality facilitates a "cold" deliberative process rather than heartfelt forgiveness, the results showed that goal instrumentality is associated with an emotional reaction (i.e., empathy) toward the transgressor. Contrary to past research (Burnette et al., 2012), however, the effect of relationship value on forgiveness was not moderated by exploitation risk. One limitation of Study 1 was its reliance on a student sample. Therefore, we conducted Study 2 to determine whether the results obtained in Study 1 can be generalized to a sample with greater demographic heterogeneity.

3. Study 2: online survey with a community sample from Japan

3.1. Method

3.1.1. Participants

A sample of 554 Japanese community-based participants were recruited through an online survey service provided by Cross Marketing Inc., Japan. However, 59 participants were excluded from data analyses for the following reasons: no transgression was reported (35), the transgressor was a relative (17), the transgressor was a stranger (3), the participant was the transgressor (1), and the transgression did not occur within the past year (1). In addition, two participants whose transgressor was deceased at the time of the study were excluded. Although this criterion was not included in the instructions, we discarded them because the death of a transgressor may have unexpected effects on forgiveness. The remaining sample consisted of 495 Japanese adults (224 females) who ranged in age from 20 to 60 years old ($M = 38.06$, $SD = 10.55$).

3.1.2. Procedure and materials

Study 2 was conducted online. All materials for this study were administered in Japanese. The materials in Study 2 were identical to those used in Study 1 with exceptions outlined below. We tailored our primary measure of perceived goal instrumentality from Study 1 for use with an adult community sample. Thus, we measured perceived goal instrumentality as it pertains to the following eight domains of life: work, part-time jobs, hobbies, volunteer activities, interpersonal relationships, romantic relationships, family relationships, and other important goals.

Furthermore, we included one additional control variable related to forgiveness, a measure of the perceived intention of the transgressor, and two additional variables related to relationship value: "rank relationship value" which involved a single question regarding transgressor utility (i.e., "Compared to all other people, how useful, overall, was transgressor was at the time of the transgression?") measured on 10-point scale (from "the transgressor was in the bottom 10 percentile" = 1 to "the transgressor was in the top 10 percentile" = 10). We also included a measure of the Welfare Tradeoff Ratio (WTR). WTR is defined as the willingness to sacrifice one's own welfare for the sake of a particular other (Tooby, Cosmides, Sell, Lieberman, & Sznycer, 2008). In this study, as in Smith, Pedersen, Forster, McCullough, and Lieberman (2017), we measured participants' WTRs for their transgressors by assessing their hypothetical willingness to make descending levels of monetary sacrifices for the transgressor (Rachlin & Jones, 2007). Because some participants' responses were inconsistent with the operationalization of this construct (e.g., they reported willingness to make some large sacrifice, but were unwilling to make smaller sacrifices), the sample size of the analyses involving WTR ($n = 353$) was smaller than the sample size of other analyses (see the Supplementary Materials for more details of the operationalization of WTR).

As in Study 1, we factor analyzed our measures of relationship value in order to use participants' latent relationship value scores as a predictor in analyses. After confirming that only one eigenvalue (1.87) of the correlation matrix of the four measures exceeded 1, we conducted a confirmatory factor analysis specifying a one-factor solution. The solution fit the data well ($\chi^2(2) = 0.19$, $p = .91$; CFI = 1.00; RMSEA = 0.000, 90% CI = [0.000, 0.043], $p = .960$; SRMR = 0.005),

Table 3
Descriptive statistics (the number of observations, means, standard deviations), Cronbach's α coefficients (in parentheses in the diagonal cells), and correlation coefficients of variables of interest (study 2).

	N	mean	*SD*	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Forgiveness	495	2.71	0.74	(0.88)	0.35_{***}	0.62_{***}	-0.23_{***}	0.34_{***}	-0.58_{***}	0.28_{***}	0.68_{***}	-0.25_{***}	0.35_{***}	-0.31_{***}	0.28_{***}
2. Instrumentality	495	−0.22	1.11		(0.90)	0.22_{***}	−0.08	0.24_{***}	-0.25_{***}	0.22_{***}	0.36_{***}	-0.29_{***}	0.24_{***}	-0.18_{**}	$.15^{a}$
3. Empathy	495	2.16	0.98			(0.88)	−0.06	0.23_{***}	-0.39_{***}	0.32_{***}	0.73_{***}	0.09	0.34_{***}	-0.23_{***}	0.28_{***}
4. Rumination	495	2.79	0.8				(0.92)	0.03	0.37_{***}	−0.02	−0.01	0.32_{***}	−0.02	0.15_{*}	−0.06
5. IOS	495	2.41	1.78					- -	-0.17_{**}	0.26_{***}	0.33_{***}	−0.11	0.23_{***}	−0.04	$.16^{a}$
6. Anger	495	3.85	0.93						(0.70)	-0.18_{**}	-0.37_{***}	0.22_{***}	-0.19_{***}	0.37_{***}	-0.28_{***}
7. Reaction	495	0.8	1.4							- -	0.37_{***}	−0.03	0.20_{***}	−0.09	0.17_{*}
8. RV (RVEX)	495	2.38	0.97								(0.80)	−0.06	0.42_{***}	-0.27_{***}	0.25_{***}
9. ER (RVEX)	495	3.01	1.03									(0.82)	−0.04	0.16_{**}	−0.07
10. Rank RV	495	4.65	3.31										- -	$-.13^{a}$	0.20_{**}
11. Intention	495	1.82	1.31											- -	−0.10
12. WTR	353	0.23	0.41												- -

"Instrumentality" "RV," and "ER" designate perceived goal instrumentality, relationship value, and exploitation risk, respectively. (The *p*-values reported in this table were adjusted by the Holm method).

[a] < 0.10.
[*] < 0.05.
[**] < 0.01.
[***] < 0.001.

with the single factor explaining 31.6% of the variance and indicator loadings ranging from 0.32 to 0.78. Factor scores were saved for use in other analyses.

3.2. Results

3.2.1. Descriptive statistics and relationship value × forgiveness correlation

Descriptive statistics of variables of interest (means, standard deviations, Cronbach's α coefficients, and correlations among the variables) are summarized in Table 3. We first confirmed the mutual correlations among the four measures of relationship value (i.e., perceived goal instrumentality, RVEX relationship value, rank relationship value, and WTR): Perceived goal instrumentality was significantly correlated with RVEX relationship value ($r_{493} = 0.36$, $p < .001$, 95% CI [0.28, 0.44]) and rank relationship value ($r_{493} = 0.24$, $p < .001$, 95% CI [0.16, 0.32]), but only marginally with WTR ($r_{351} = 0.15$, $p = .071$, 95% CI [0.05, 0.25]) after adjusting the *p*-values for multiple comparisons by the Holm method. RVEX relationship value was significantly correlated with rank relationship value ($r_{493} = 0.42$, $p < .001$, 95% CI [0.34, 0.49]) and WTR ($r_{351} = 0.25$, $p < .001$, 95% CI [0.15, 0.34]). Finally, rank relationship value was significantly correlated with WTR ($r_{351} = 0.20$, $p = .004$, 95% CI [0.10, 0.30]). These moderate correlations among the four relationship value measures are consistent with the assumption that the four measures shared common construct variance, while also possessing different sources of method variance.

We then examined whether the four measures of relationship value were correlated with forgiveness, and whether perceived goal instrumentality, rank relationship value, and WTR were less "emotional" than RVEX relationship value. Perceived goal instrumentality was significantly correlated with forgiveness, $r_{493} = 0.35$, $p < .001$, 95% CI [0.27, 0.42] after adjustment for multiple comparisons by the Holm method. In addition, the correlations between forgiveness and RVEX relationship value ($r_{493} = 0.68$, $p < .001$, 95% CI [0.63, 0.72]), rank relationship value ($r_{493} = 0.35$, $p < .001$, 95% CI [0.27, 0.42]), and WTR ($r_{351} = 0.28$, $p < .001$, 95% CI [0.18, 0.37]) were also significant after adjustment by the Holm method. The perceived goal instrumentality–empathy correlation (0.22) was significantly smaller than the RVEX relationship value–empathy correlation (0.73), $t(492) = 14.66$, $p < .001$ by Hotelling's test for correlated correlations. In addition, the rank relationship value–empathy correlation (0.34) and the WTR–empathy correlation (0.28) were also significantly smaller than the RVEX relationship value–empathy correlation, $t(492) = 11.82$, $p < .001$ for rank relationship value and $t(350) = 10.27$, $p < .001$ for WTR.

3.2.2. Is the relationship value–forgiveness association explained by confounding variables?

As shown in Table 2 (see also Table S2 for 95% CIs for regression coefficients), a multiple regression analysis revealed that perceived goal instrumentality significantly predicted forgiveness (β = 0.16, $p < .001$, 95% CI [0.09, 0.23]) after controlling for potential confounds (i.e., sex, closeness, anger at the transgressor, transgressor reaction). In addition, comparable multiple regression analyses with RVEX relationship value, rank relationship value, and latent relationship value as the independent variable also revealed significant associations with forgiveness (β = 0.50, $p < .001$, 95% CI [0.44, 0.57] for RVEX relationship value; β = 0.19, $p < .001$, 95% CI [0.12, 0.26] for rank relationship value; and β = 0.49, $p < .001$, 95% CI [0.41, 0.57] for latent relationship value; however, WTR was not significant in the comparable regression analysis (β = 0.07, $p = .111$, 95% CI [−0.02, 0.15]).

3.2.3. Is the relationship value–forgiveness association mediated by empathy?

To test the predicted mediation effect, we first examined the zero-order correlations among our three main variables. As shown in Table 3, perceived goal instrumentality was significantly correlated with forgiveness ($r_{493} = 0.35$, $p < .001$, 95% CI [0.27, 0.42]) and empathy ($r_{493} = 0.22$, $p < .001$, 95% CI [0.13, 0.30]), and empathy was significantly correlated with forgiveness ($r_{493} = 0.62$, $p < .001$, 95% CI [0.56, 0.70]). As shown in Fig. 1b, once the effect of empathy on forgiveness was statistically controlled, the association between perceived goal instrumentality and forgiveness decreased from 0.35 to 0.23 (both $p < .001$; $P_M = 0.35$). The indirect effect based on the bootstrapping procedure (10,000 samples) was 0.12, 95% CI [0.06, 0.19].

We examined whether this partial mediation is replicable with the three other measures of relationship value and latent relationship value. The association between RVEX relationship value and forgiveness decreased from 0.68 to 0.49 (both $p < .001$; $P_M = 0.28$). The indirect effect was 0.19, 95% CI [0.11, 0.27] (see Fig. S1b in the Supplementary Materials). The association between rank relationship value and forgiveness decreased from 0.35 to 0.16 (both $p < .001$; $P_M = 0.55$). The indirect effect was 0.19, 95% CI [0.14, 0.25] (see Fig. S2a in the Supplementary Materials). Although the association between WTR and forgiveness was not significant after controlling for potential

Table 4
Descriptive statistics (the number of observations, means, standard deviations), Cronbach's α coefficients (in parentheses in the diagonal cells), and correlation coefficients of variables of interest (study 3).

	N	mean	*SD*	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Forgiveness	448	2.94	0.83	(0.90)	0.24***	0.73***	−0.29***	0.11	−0.55***	0.35***	0.81***	−0.38***	0.15*	−0.11	0.25***
2. Instrumentality	443	0.13	1.12		(0.87)	0.22***	−0.06	0.25***	−0.15*	.14[a]	0.26***	−0.11	0.28***	−0.08	0.39***
3. Empathy	448	2.26	1.09			(0.89)	−0.09	0.18**	−0.45***	0.37***	0.83***	−0.10	0.20***	0.00	0.35***
4. Rumination	448	2.59	0.73				(0.89)	0.20***	0.38***	0.07	−0.08	0.40***	0.08	0.19**	0.20**
5. IOS	448	3.95	1.74					- -	0.00	0.30***	0.22***	−0.01	0.21***	0.19**	0.46***
6. Anger	448	3.57	0.9						(0.65)	−0.10	−0.43***	0.29***	−0.17*	0.24***	−0.19**
7. Reaction	448	1.6	1.69							- -	0.41***	−0.08	0.20***	0.11	0.25***
8. RV (RVEX)	448	2.42	1.14								(0.88)	−0.12	0.21***	−0.07	0.32***
9. ER (RVEX)	448	2.83	0.99									(0.77)	−0.02	0.16*	−0.04
10. Rank RV	448	5.73	2.95										- -	−0.02	0.32***
11. Intention	448	1.47	1.00											- -	0.01
12. WTR	356	0.59	0.41												- -

"Instrumentality" "RV," and "ER" designate perceived goal instrumentality, relationship value, and exploitation risk, respectively. (The *p*-values reported in this table were adjusted by the Holm method).

[a] < 0.10
* < 0.05.
** < 0.01.
*** < 0.001.

confounding variables in a multiple regression analysis (Table 2), because the bivariate correlation between WTR and forgiveness was significant (Table 3), we conducted a comparable mediation analysis. The association between WTR and forgiveness decreased from 0.29 ($p < .001$) to 0.10 ($p = .020$; $P_M = 0.64$). The indirect effect was 0.19, 95% CI [0.12, 0.27] (see Fig. S3a in the Supplementary Materials). The association between latent relationship value and forgiveness decreased from 0.73 to 0.45 (both $p < .001$; $P_M = 0.37$). The indirect effect was 0.27, 95% CI [0.19, 0.36] (see Fig. S4b in the Supplementary Materials). Therefore, regardless of the type of measure of relationship value, empathy appeared to mediate the relationship value–forgiveness association.

3.2.4. Does exploitation risk moderate the relationship value–forgiveness link?

As in Study 1, we conducted a multiple regression analysis involving the interaction between perceived goal instrumentality and exploitation risk. Although perceived goal instrumentality and exploitation risk were significant predictors of forgiveness (β = 0.30, $p < .001$, 95% CI [0.21, 0.39] for perceived goal instrumentality; β = −0.16, $p < .001$, 95% CI [−0.25, −0.08] for exploitation risk), their interaction was not (β = 0.02, $p = .599$, 95% CI [−0.06, 0.11]). Fig. 2b visually confirms the lack of interaction. We also confirmed the non-significant interaction using different operationalizations of relationship value (see Table S4 in the Supplementary Materials). Thus, Study 2 again failed to replicate the previously reported interactive effect of the relationship value × exploitation risk on forgiveness (Burnette et al., 2012), here with a community sample of Japanese adults and two additional measures of relationship value.

3.3. Study 2 discussion

Study 2 confirmed the goal instrumentality–forgiveness association and the mediation by empathy with a Japanese online sample. Study 2 also expanded upon Study 1 by including two additional measures of relationship value: rank relationship value and WTR. Although the association between WTR and forgiveness was weaker, the general patterns were replicated. The relationship value × exploitation risk interaction was not replicated with any measures among the Japanese online sample. To corroborate these results, we conducted Study 3 (a cross-cultural replication of Study 2) using an online sample from the United States.

4. Study 3: online survey with a community sample from the U.S.

4.1. Method

A total of 497 U.S. users of Amazon's Mechanical Turk participated in this study. However, 49 participants were excluded from data analyses for the following reasons: the transgression did not occur within the past year (22), no transgression was reported (7), the transgressor was a relative (6), the participant completed the study more than once (6), no transgressor was specified (3), the transgressor was a stranger (3), the participant was the transgressor (1), and the transgressor was deceased at the time of the study (1). The remaining sample consisted of 448 U.S. adults (212 women) who ranged in age from 18 to 70 years old ($M = 32.96$, $SD = 9.95$). Participants were rewarded 1.00 US dollar.

The procedure for Study 3 was identical to Study 2. All materials used in Study 2 (except the measures originally developed in English) were translated into English, and administered in Study 3. The materials of Study 3 were thus identical to those of Study 2. For the same reason as with Study 2, the number of useable data points for WTR ($n = 356$) in Study 3 was less than the overall sample size.

As in Study 2, we conducted a factor analysis using the four measures of relationship value (composite goal instrumentality relationship value, composite RVEX relationship value, rank relationship value, and WTR). Due to missing values in the four relationship value measures, the sample size of latent relationship value analyses was slightly smaller than other analyses ($n = 352$). Eigenvalues of a correlation matrix of the four measures yielded one eigenvalue greater than one (1.93), with a one-factor solution fitting the data well ($\chi^2(2) = 2.00$, $p = .367$; CFI = 1.00; RMSEA = 0.002, 90% CI = [0.000, 0.106], $p = .627$; SRMR = 0.016), explaining 31.6% of the variance. Indicator loadings ranged from 0.45 to 0.63. As in Studies 1 and 2, we saved factor scores for use in other analyses.

4.2. Results

4.2.1. Descriptive statistics and the relationship value × forgiveness correlation

Descriptive statistics of variables of interest (means, standard deviations, Cronbach's α coefficients, and correlations among the variables) are summarized in Table 4. As in Study 2, the four measures of relationship value (i.e., perceived goal instrumentality, RVEX relationship value, rank relationship value, and WTR) were significantly and moderately intercorrelated: Perceived goal instrumentality was

significantly correlated with RVEX relationship value ($r_{441} = 0.26$, $p < .001$, 95% CI [0.17, 0.35]), rank relationship value ($r_{441} = 0.28$, $p < .001$, 95% CI [0.19, 0.36]), and WTR ($r_{354} = 0.39$, $p < .001$, 95% CI [0.30, 0.48]) after adjusting the *p*-values for multiple comparisons by the Holm method. RVEX relationship value was significantly correlated with rank relationship value ($r_{446} = 0.21$, $p < .001$, 95% CI [0.12, 0.30]) and WTR ($r_{354} = 0.32$, $p < .001$, 95% CI [0.22, 0.41]). Finally, rank relationship value was significantly correlated with WTR ($r_{354} = 0.32$, $p < .001$, 95% CI [0.22, 0.41]).

We then examined whether the four measures of relationship value were correlated with forgiveness, and whether perceived goal instrumentality, rank relationship value, and WTR were less "emotional" than RVEX relationship value. Perceived goal instrumentality was significantly correlated with forgiveness, $r_{441} = 0.24$, $p < .001$, 95% CI [0.15, 0.32] after adjustment for multiple comparisons by the Holm method. In addition, the correlations between forgiveness and RVEX relationship value ($r_{446} = 0.81$, $p < .001$, 95% CI [0.77, 0.84]), rank relationship value ($r_{441} = 0.15$, $p = .040$, 95% CI [0.06, 0.24]), and WTR ($r_{354} = 0.25$, $p < .001$, 95% CI[0.15, 0.34]) were also significant after adjustment by the Holm method. The perceived goal instrumentality–empathy correlation (0.22) was significantly smaller than the RVEX relationship value–empathy correlation (0.83), $t(445) = 18.96$, $p < .001$, by Hotelling's test for correlated correlations. The rank relationship value–empathy correlation (0.20) and the WTR–empathy correlation (0.35) were also significantly smaller than the RVEX relationship value–empathy correlation, $t(445) = 20.59$, $p < .001$ for rank relationship value and $t(353) = 13.90$, $p < .001$ for WTR.

4.2.2. Is the relationship value–forgiveness association explained by confounding variables?

As shown in Table 2 (see Table S3 for 95% CIs for regression coefficients), a multiple regression analysis revealed that perceived goal instrumentality is significantly associated with forgiveness (β = 0.13, $p = .001$; 95% CI [0.05, 0.20]) after controlling for potential confounds (i.e., sex, closeness, anger at the transgressor, transgressor reaction). In addition, comparable multiple regression analyses showed that the effect of RVEX relationship value on forgiveness was significant (β = 0.69, $p = .001$; 95% CI [0.63, 0.75]), as was the effect of latent relationship value (β = 0.26, $p < .001$; 95% CI [0.16, 0.35]). However, rank relationship value was not significantly associated with forgiveness (β = −0.0002, *ns*, 95% CI [−0.08, 0.08]), nor was WTR (β = 0.08, *ns*, 95% CI [−0.02, 0.18]).

4.2.3. Is the relationship value–forgiveness association mediated by empathy?

As shown in Table 4, perceived goal instrumentality was significantly correlated with forgiveness ($r_{441} = 0.24$, $p < .001$, 95% CI [0.15, 0.32]) and empathy ($r_{441} = 0.22$, $p < .001$, 95% CI [0.13, 0.30]), and empathy was significantly correlated with forgiveness ($r_{446} = 0.73$, $p < .001$, 95% CI [0.68, 0.77]). As shown in Fig. 1c, once the effect of empathy on forgiveness was statistically controlled, the association between perceived goal instrumentality and forgiveness decreased from 0.24 to 0.08 ($p = .011$; $P_M = 0.65$). The indirect effect based on the bootstrapping procedure with 10,000 samples was 0.15, 95% CI [0.09, 0.22].

We then examined whether this partial mediation is replicable with the three other measures of relationship value and the latent relationship value scores (although rank relationship value and WTR were not significant predictors of forgiveness in the multiple regression analyses reported in Table 2). The association between RVEX relationship value and forgiveness decreased from 0.81 to 0.65 (both $p < .001$; $P_M = 0.19$). The indirect effect was 0.16, 95% CI [0.07, 0.25] (see Fig. S1c in the Supplementary Materials). The association between rank relationship value and forgiveness decreased from 0.15 ($p = .002$) to 0.002 (*ns*). The indirect effect was 0.15, 95% CI [0.08, 0.22] (see Fig. S2b in the Supplementary Materials). The association between WTR and forgiveness decreased from 0.26 ($p < .001$) to −0.02 (*ns*). The indirect effect was 0.28, 95% CI [0.19, 0.36] (see Fig. S3b in the Supplementary Materials). Finally, the association between the latent measure of relationship value and forgiveness decreased from 0.48 ($p < .001$) to 0.11 ($p = .011$; $P_M = 0.23$). The indirect effect was 0.37, 95% CI [0.29, 0.46] (see Fig. S4c in the Supplementary Materials). Therefore, the partial mediation was replicated by the measure of perceived goal instrumentality, RVEX relationship value, and latent relationship value, while the apparent effects of rank relationship value and WTR were fully mediated by empathy.

4.2.4. Does exploitation risk moderate the relationship value–forgiveness association?

We conducted a multiple regression analysis involving the interaction between perceived goal instrumentality and exploitation risk. In Study 3, replicating Burnette et al.'s (2012) results, not only perceived goal instrumentality (β = 0.22, $p < .001$, 95% CI [0.13, 0.30]) and exploitation risk (β = −0.38, $p < .001$, 95% CI [−0.46, −0.29]) but also their interaction was significant (β = −0.11, $p = .007$, 95% CI [−0.20, −0.03]). Fig. 2c visually confirms the interaction effect. Simple slope analyses indicated the effect of goal instrumentality was significant at both high ($b = 0.08$, $p = .037$) and low ($b = 0.24$, $p < .001$) levels of perceived exploitation risk.

We confirmed the significant interaction effect using the RVEX relationship value (β = −0.07, $p = .005$, 95% CI [−0.12, −0.02]; see Table S4 in the Supplementary Materials for more details of the regression coefficients). Simple slope analyses indicated that the effect of RVEX relationship value was significant at the high ($b = 0.50$, $p < .001$) and low ($b = 0.61$, $p < .001$) levels of exploitation risk. Latent relationship value replicated this effect (β = −0.12, $p = .01$, 95% CI [−0.21, −0.03] for their interaction; see also Table S4), with simple slopes analyses indicating that the effect of the latent measure of relationship value was significant at the high ($b = 0.34$, $p < .001$) and low ($b = 0.56$, $p < .001$) levels of exploitation risk. However, the interaction effect was not significant when rank relationship value and WTR were used as the measure of relationship value in the multiple regression analysis (see Table S4). In sum, when the relationship value × exploitation risk interaction effect was significant (i.e., when goal instrumentality, RVEX relationship value and latent relationship value were analyzed), the association of relationship value and forgiveness was stronger at low levels of, as compared to high levels of, exploitation risk.

4.3. Study 3 discussion

As in Studies 1 and 2, perceived goal instrumentality was significantly associated with forgiveness, and the association appeared to be mediated by empathy. The comparable pattern was found when RVEX relationship value and latent relationship value were analyzed. In addition, a relationship value × exploitation risk interaction effect on forgiveness, which was not replicated in Japan (Studies 1 and 2), was replicated in the U.S. for two of our four measures of relationship value, and for the latent relationship value scores. The reason why rank relationship value and WTR failed to confirm the predictions in the U.S. community sample is not clear from the present study.

5. General discussion

Three autobiographical recall studies convergently showed that perceived goal instrumentality (a less affectively laden operationalization of relationship value) is associated with forgiveness in Japan (Studies 1 and 2) and the U.S. (Study 3). The three studies also showed that the association of perceived goal instrumentality with forgiveness is plausibly mediated by empathy for one's transgressor. Comparable evidence for the relationship value–forgiveness association and

mediation by empathy were also found when other operationalizations of relationship value, such as RVEX relationship value and latent relationship value, were analyzed. Although this pattern was less evident when a single-item measure of relationship value (i.e., rank relationship value) and willingness to sacrifice one's welfare for one's partner (i.e., WTR) were analyzed, the valuable relationships hypothesis was consistently supported in two countries with at least two different measures of relationship value and a latent variable approach. Therefore, the present research provides additional evidence for the valuable relationships hypothesis. It appears that irrespective of how relationship value is measured, it is a reliable predictor of human forgiveness.

Our secondary purpose was to cross-culturally replicate a previously observed relationship value × exploitation risk interaction effect on forgiveness: Burnette et al. (2012) found that U.S. participants were most forgiving of their transgressors when relationship valuable is high *and* perceived exploitation risk is low. We failed to replicate this interaction in Japan, but we successfully replicated it in the U.S. on two of four measures and when using a latent variable to represent relationship value. Although we do not have any definitive explanation for this unexpected cultural difference, we suspect that the emphasis on ingroup harmony in collectivistic cultures might be partly responsible for this unexpected result (Triandis, Bontempo, Villareal, Asai, & Lucca, 1988). Notice that the cultural difference was due to Japanese participants' greater tendency to forgive valuable—but possibly exploitative—transgressors. Despite the exploitation risk, it is likely that these valuable others are ingroup members. Thus, participants might have forgiven their potentially exploitative transgressors because of peer/societal pressures to maintain ingroup harmony (Kadima Kadiangandu, Mullet, & Vinsonneau, 2001; Suwartono, Prawasti, & Mullet, 2007).

Although the three studies provide clear evidence for the valuable relationships hypothesis, there are some limitations in the present research. First, our approach to measuring relationship value (i.e., as goal-related instrumentality) may not cover the construct in its entirety. Consider, for example, that allies are valuable not only for their usefulness in helping us achieve our goals; they are also useful as a source of social support in times of need (Cronk et al., 2019). None of the measures we used in the present studies assayed for whether one's transgressor had ever provided costly support during a time of need, which points to an interesting opportunity for future research.

Second, the three reported studies were autobiographical recall studies, so they may have been subject to memory biases. For example, one might underestimate pre-conflict relationship value if one has not yet fully forgiven their transgressor. Likewise, had participants already forgiven their transgressors, they might overestimate how valuable their transgressors were at the time of the transgression. Such distorted patterns of recall could inflate the observed correlation between pre-conflict relationship value and the current level of forgiveness. To eliminate the issues associated with memory biases, longitudinal studies involving participants who recently experienced some interpersonal transgression are needed (see McCullough et al., 2010, 2014, as examples of such longitudinal studies).

Third, although a series of mediation analyses generally confirmed the prediction that the relationship value–forgiveness association is mediated by empathy, the significant result of the mediation analysis does not prove the mediational role of empathy (Fiedler, Schott, & Meiser, 2011). Experimental studies, in which perceived goal instrumentality is experimentally heightened in a treatment group (e.g., Nelissen, 2014), are required to firmly confirm the validity of the mediation hypothesis. Such experimental research is also required to confirm the hypothesized causation from relationship value to forgiveness. Fourth, we did not observe the consistent patterns when the single-item measure of relationship value (i.e., rank relationship value) and the measure of willingness to sacrifice one's welfare for the sake of a particular other (i.e., WTR) were analyzed, especially in Study 3. Further studies are needed to validate the usefulness of these measures. Finally, although this research included four different measures of relationship value, it relied on one measure of forgiveness. We need conceptual replications including different measures of forgiveness to confirm the robustness of our findings. Despite these limitations, the present research clearly suggests that human forgiveness at least partially reflects the operation of psychological adaptations that act to preserve valuable interpersonal relationships.

Acknowledgement

This work was supported by the Japan Society for the Promotion of Science [KAKENHI 15H03447 to Y.O. and 16K04275 to K.Y.]; and the John Templeton Foundation[to MEM].

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.evolhumbehav.2019.09.003.

References

Aron, A., Aron, E. N., & Smollan, D. (1992). Inclusion of other in the self scale and the structure of interpersonal closeness. *Journal of Personality and Social Psychology, 63*, 596–612. https://doi.org/10.1037/0022-3514.63.4.596.

Aureli, F., & de Waal, F. B. M. (2000). *Natural conflict resolution.* Berkley, CA: University of California Press.

Batson, C. D., Duncan, B. D., Ackerman, P., Buckley, T., & Birch, K. (1981). Is empathic emotion a source of altruistic motivation? *Journal of Personality and Social Psychology, 40*, 290–302. https://doi.org/10.1037/0022-3514.40.2.290.

Beeney, J., Franklin, R. G., Jr., Levy, K. N., & Adams, R. B., Jr. (2011). I feel your pain: Emotional closeness modulates neural responses to empathically experienced rejection. *Social Neuroscience, 6*, 369–376. https://doi.org/10.1080/17470919.2011.557245.

Burnette, J. L., McCullough, M. E., Van Tongeren, D. R., & Davis, D. E. (2012). Forgiveness results from integrating information about relationship value and exploitation risk. *Personality and Social Psychology Bulletin, 38*, 345–356. https://doi.org/10.1177/0146167211424582.

Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Cronk, L., Berbesque, C., Conte, T., Gervais, M., Lyer, P., McCarthy, B., Sonkoi, D., Townsend, C., & Aktipis, A. (2019). Managing risk through cooperation: Need-based transfers and risk pooling among the societies of the Human Generosity Project. In L. R. Lozny, & T. H. McGovern (Eds.). *Global perspectives on long-term community resource management* (pp. 41–75). Cham, Switzerland: Springer. https://doi.org/10.1007/978-3-030-1.

Fehr, R., Gelfand, M. J., & Nag, M. (2010). The road to forgiveness: A meta-analytic synthesis of its situational and dispositional correlates. *Psychological Bulletin, 136*, 894–914. https://doi.org/10.1037/a0019993.

Fiedler, K., Schott, M., & Meiser, T. (2011). What mediation analysis can (not) do. *Journal of Experimental Social Psychology, 47*, 1231–1236. https://doi.org/10.1016/j.jesp.2011.05.007.

Fitzsimons, G. M., & Shah, J. Y. (2008). How goal instrumentality shapes relationship evaluations. *Journal of Personality and Social Psychology, 95*, 319–337. https://doi.org/10.1037/0022-3514.95.2.319.

Horowitz, M. J., Wilner, N., & Alvarez, W. (1979). Impact of event scale: A measure of subjective stress. *Psychosomatic Medicine, 41*, 209–218. https://doi.org/10.1097/00006842-197905000-00004.

Kadima Kadiangandu, J., Mullet, E., & Vinsonneau, G. (2001). Forgiveness: A Congo-France comparison. *Journal of Cross-Cultural Psychology, 32*, 504–511. https://doi.org/10.1177/0022022101032004009.

McCullough, M. E. (2008). *Beyond revenge: The evolution of the forgiveness instinct.* San Francisco, CA: Jossey-Bass.

McCullough, M. E., Bono, G., & Root, L. M. (2007). Rumination, emotion, and forgiveness: Three longitudinal studies. *Journal of Personality and Social Psychology, 92*, 490–505. https://doi.org/10.1037/0022-3514.92.3.490.

McCullough, M. E., Kurzban, R., & Tabak, B. A. (2013). Cognitive systems for revenge and forgiveness. *Behavioral and Brain Sciences, 36*, 1–15. https://doi.org/10.1017/S0140525X11002160.

McCullough, M. E., Luna, L. R., Berry, J. W., Tabak, B. A., & Bono, G. (2010). On the form and function of forgiving: Modeling the time-forgiveness relationship and testing the valuable relationships hypothesis. *Emotion, 10*, 358–376. https://doi.org/10.1037/a0019349.

McCullough, M. E., Pedersen, E. J., Tabak, B. A., & Carter, E. C. (2014). Conciliatory gestures promote forgiveness and reduce anger in humans. *Proceedings of the National Academy of Sciences USA, 111*, 11211–11216. https://doi.org/10.1073/pnas.1405072111.

McCullough, M. E., Rachal, K. C., Sandage, S. J., Worthington, E. L., Jr., Brown, S. W., & Hight, T. L. (1998). Interpersonal forgiving in close relationships: II. Theoretical elaboration and measurement. *Journal of Personality and Social Psychology, 75*,

1586–1603. https://doi.org/10.1037/0022-3514.75.6.1586.
McCullough, M. E., Worthington, E. L., Jr., & Rachal, K. C. (1997). Interpersonal forgiving in close relationships. *Journal of Personality and Social Psychology, 73*, 321–336. https://doi.org/10.1037/0022-3514.73.2.321.
Meyer, M. L., Masten, C. L., Ma, Y., Wang, C., Shi, Z., Eisenberger, N. I., & Han, H. (2013). Empathy for the social suffering of friends and strangers recruits distinct patterns of brain activation. *Social Cognitive and Affective Neuroscience, 8*, 446–454. https://doi.org/10.1093/scan/nss019.
Nelissen, R. M. A. (2014). Relational utility as a moderator of guilt in social interactions. *Journal of Personality and Social Psychology, 106*, 257–271. https://doi.org/10.1037/a0034711.
Ohtsubo, Y., Matsunaga, M., Tanaka, H., Suzuki, K., Kobayashi, F., Shibata, E., ... Ohira, H. (2018). Costly apologies communicate conciliatory intention: An fMRI study on forgiveness in response to costly apologies. *Evolution and Human Behavior, 39*, 249–256. https://doi.org/10.1016/j.evolhumbehav.2018.01.004.
Ohtsubo, Y., & Watanabe, E. (2009). Do sincere apologies need to be costly? Test of a costly signaling model of apology. *Evolution and Human Behavior, 30*, 114–123. https://doi.org/10.1016/j.evolhumbehav.2008.09.004.
Ohtsubo, Y., Watanabe, E., Kim, J., Kulas, J. T., Muluk, H., Nazar, G., ... Zhang, J. (2012). Are costly apologies universally perceived as being sincere?: A test of the costly apology-perceived sincerity relationship in seven countries. *Journal of Evolutionary Psychology, 10*, 187–204. https://doi.org/10.1556/JEP.10.2012.4.3.
Ohtsubo, Y., & Yagi, A. (2015). Relationship value promotes costly apology-making: Testing the valuable relationships hypothesis from the perpetrator's perspective. *Evolution and Human Behavior, 36*, 232–239. https://doi.org/10.1016/j.evolhumbehav.2014.11.008.
Ohtsubo, Y., Yamaura, K., & Yagi, A. (2015). Development of Japanese measures of reconciliatory tendencies: The Japanese trait forgivingness scale and the Japanese proclivity to apologize measure. *Japanese Journal of Social Psychology, 31*, 135–142. https://doi.org/10.14966/jssp.31.2_135.
Petersen, M. B., Sell, A., Tooby, J., & Cosmides, L. (2012). To punish or repair? Evolutionary psychology and lay intuitions about modern criminal justice. *Evolution and Human Behavior, 33*, 682–695. https://doi.org/10.1016/j.evolhumbehav.2012.05.003.
Rachlin, H., & Jones, B. A. (2007). Social discounting and delay discounting. *Journal of Behavioral Decision Making, 21*, 29–43. https://doi.org/10.1002/bdm.567.
Rosseel, Y. (2012). Lavaan: An R package for structural equation modeling. *Journal of Statistical Software, 48*. https://doi.org/10.18637/jss.v048.i02.
Smith, A., Pedersen, E. J., Forster, D. E., McCullough, M. E., & Lieberman, D. (2017). Cooperation: The role of interpersonal value and gratitude. *Evolution and Human Behavior, 38*, 695–703. https://doi.org/10.1016/j.evolhumbehav.2017.08.003.
Suwartono, C., Prawasti, C. Y., & Mullet, E. (2007). Effect of culture on forgivingness: A southern Asia-Western Europe comparison. *Personality and Individual Differences, 42*, 513–523. https://doi.org/10.1016/j.paid.2006.07.027.
Tabak, B. A., McCullough, M. E., Luna, L. R., Bono, G., & Berry, J. W. (2012). Conciliatory gestures facilitate forgiveness and feelings of friendship by making transgressors appear more agreeable. *Journal of Personality, 80*, 503–536. https://doi.org/10.1111/j.1467-6494.2011.00728.x.
Tooby, J., Cosmides, L., Sell, A., Lieberman, D., & Sznycer, D. (2008). Internal regulatory variables and the design of human motivation: A computational and evolutionary approach. In A. Elliot (Ed.). *Handbook of approach and avoidance motivation* (pp. 251–271). Mahwah, NJ: Lawrence.
Triandis, H. C., Bontempo, R., Villareal, M. J., Asai, M., & Lucca, N. (1988). Individualism and collectivism: Cross-cultural perspectives on self-ingroup relationships. *Journal of Personality and Social Psychology, 54*, 323–338. https://doi.org/10.1037/0022-3514.54.2.323.
de Waal, F. B. M. (2000). Primates–a natural heritage of conflict resolution. *Science, 289*, 586–590. https://doi.org/10.1126/science.289.5479.586.
de Waal, F. B. M., & Aureli, F. (1997). Conflict resolution and distress alleviation in monkeys and apes. Annals of the New York Academy of Sciences In C. S. Carter, I. I. Lederhendler, & B. Kirkpatrick (Vol. Eds.), *The integrative neurobiology of affiliation. Vol. 807. The integrative neurobiology of affiliation* (pp. 317–328). New York, NY, US: New York Academy of Sciences.
Worthington, E. L., Jr., Witvliet, C. V. O., Pietrini, P., & Miller, A. J. (2007). Forgiveness, health, and well-being: A review of evidence for emotional versus decisional forgiveness, dispositional forgiveness, and reduced unforgiveness. *Journal of Behavioral Medicine, 30*, 291–302. https://doi.org/10.1007/s10865-007-9105-8.